Quality of Public Education based on the State's Economics

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Abstract

It is proposed that the economic conditions of a state can explain the quality of public education in that state. The GDP per capita, personal income per capita, and poverty levels for each state are observed to evaluate the economic conditions, and an average ranking is observed to determine the quality of education in each state. Both simple and multiple regression analyses are conducted to determine the relationship between the dependent variable and the independent variables. The analysis shows a positive relationship between economic conditions and quality of education in a state.x

I. Introduction

In politics, the falling quality of public education in the United States when compared to other countries is a frequently visited topic. With falling quality of education across the country, America is seeing an increase in skilled labor hired overseas, which has created a lack of employment opportunities for american citizens. As a result, politicians at both the state and national levels have recently and often discussed the potential for improvement to the public school systems in the state or country. With this discussion, it is necessary to determine and understand some of the factors that affect and indicate quality of education.

This paper analyzes economic factors that are predicted to influence the quality of public education in each state. A variety of aspects of all 50 states' economies that contribute to the quality of their respective public education system will be considered. The degree to which these factors contribute to the successes or failures of the public school systems can then be determined and analyzed based on our research and analysis. If such relationships between state economic conditions and quality of public education, then the improvement of the public school systems in the United States can be sped up through targeted economic policy.

While this study focuses on the impact of quality of education on factors such as GDP, the impact of personal income and some other economic factors on quality of education has frequently been studied. Previous studies, however, have focused on the quality of education's impact on economic factors rather than economic factors' impact on educational quality, and these relationships have often been studied internationally as opposed to within the United States alone. Those previous studies have determined that there is a positive relationship between quality of education and GDP, as well as many other factors. The existence of such a relationship, paired with the results of this study, provides a path for economic improvement in each state or district. If economic factors driving quality of education can be identified, these factors can be targeted in order to improve the quality of schools systems in the specified area with the indirect impact of improving economic conditions in that area.

We propose that better economic conditions in a state indicate a higher quality of the public education system in the state. The economic conditions in a state will be measured by a variety of different variables. Specifically, we propose that higher levels of GDP per capita, higher personal income per capita, and lower poverty levels will indicate that higher quality in the public school systems of the state. In addition to the prior variables, we will also examine the impact of the Gini coefficient and state income tax levels on the quality of education. Multiple linear and multiple regressions were performed to test the validity of this hypothesis.

II. Literature Review

There have been multiple studies on education and the effect both quality and level of education have on the future of people's' lives. There have also been studies on how income of different populations and the history of the area affect the quality of the school systems in the United States. Wilson (2002) looks at the aforementioned relationship. Wilson states that it is universally acknowledged that the more years of schooling the higher earnings an individual will have. Wilson took data on individuals late into their twenties and early thirties so the data collected could show the true relationship between money spent on education and future income of the future individual. The other variables looked at were family characteristics, neighborhood characteristics, labor market experience, and school district expenditure per student. Wilson found that there was a positive relationship between income and school spending, parent's education, and being surrounded by mother-only families. Parent's education only has a significant effect on the person's future income if the parent's attended college than just graduating from high school. It was also found that stressful events during childhood and having many siblings have a negative relationship with future income. Wilson concluded her findings in that the effect of school quality on future income was significant and that the effect of school quality would be expected to be larger that individual stays in school. The effect of school expenditures increased in magnitude as the sample age increased as well. Wilson looked at similar variables looked at in this paper, but which variables affect each other are different. The other independent variables looked at in this paper are more extensive.

Basher and Lagerlof (2008) analyzes how income gaps can be explained by the amount of secondary school in a state. The data they looked at are from 1850 and 1900. The rationalization behind these dates is that high ranking institutions don't just pop-up overnight. Top-ranked institutions get there because of historical coincidences like slavery, population density, railway density, and sex ratio. These coincidences are the independent variables used in the study. Slavery data was from 1850 and the authors argue that slavery can only explain some variation in education in the United States because only a few states practiced slavery and there are regions that have relatively low levels of education and per-capita income that never had slavery. Population density was looked at because “shorter geographical distances between people enhances the exchange of ideas and accumulation of skills.” In other words, the more people in one location, the more people are going to discuss and challenge what is in front of them. There was also a tendency in cities to have higher wages than in rural areas. The explanation for this was that cities encourage learning where in rural areas it is encouraged to learn a trade, or a skilled job. Where there are people, there are ways to be transported. There was a high correlation between population density and railway density in 1900. Meaning that people who lived in dense areas were able to connect easier, with people in the same area and with people in other dense regions, than people who were not. It was also found that the sex ration in 1900 (men:women) was negatively correlated with income and education. The authors conclude that the variables used were all valid instruments and that university education has a positive effect on per-capita incomes. Again this article is similar to what this paper will look at in the simple regression, but different in the multiple regression.

Blankenau and Youderian (2015) has also looked at the two variables used in the simple regression, but flipped. They focus on how spending more money on early childhood education relates to the income the the children later in life. It is stated that the likelihood of a child who grew up in a low income family was more likely to have lower income because lower income families aren’t able to contribute much more money than the what the government already spends. The reverse, for higher income children and families, was stated as well. Higher income families are able to spend extra money on school. This creates the gap in the amount of money each child receives. The paper argues that if the government gave more money to childhood education, then the wealthier parents wouldn’t spend as much extra on early childhood education and the gap of how much money spent on each child would grow smaller and eventually wouldn’t have an effect on future income. The variables looked at were the innate ability of the child received through his/her parents, education expenditures in the kth period of life (early childhood,middle childhood, late childhood), and parental human capital. Education expenditures variable was broken down into government spending and parental education spending. Multiple experiments occurred and the results were that with the current government policies in place, the funding has a large effect on the persistence of income across generations, an increase in early childhood education decreased the gap by 26 percent, and that a large increase in spending on later years of education has almost no effect on persistence.

Krueger and Lindahl (2000) seek to create a model that examines the way “policies may interact with the quality of education across communities, residence choices, and individual welfare” when heterogenous income among individuals is assumed. The authors begin with the proven assumption that higher educational expenditure leads to increased quality of education among communities. As such, the authors begin with the statement that an increased GDP combined with beneficial policies increases the quality of education. In addition to this proven assumption, the authors also state that policies which increase expenditures in the lowest income areas will create the greatest improvement to quality of education. This statement furthers the proof of the relationship between school system expenditures and quality of education. The model possesses the features of “communities, individuals who differ with respect to income and who are able to exercise some element of choice with respect to where they wish to reside, technologies that transform expenditures on education into a quality of education and quality of education into future income, and a mechanism that translates individual preferences into a collective choice”. The model indicates that there is a positive relationship between income and quality of education. It shows that a community with a more highly ranked school system (even if just slightly) will attract a higher income residential group. Thus, as individuals’ incomes improve, they will move to these communities with higher education. This reaction will increase the average income in higher ranked school systems and decrease the average income in lower ranked school systems.

The previous articles prove that there is a relationship between education and income. What they don’t prove is that the quality of a state’s public school system can be determined by the state’s economic level. Specifically the quality of the school system being determined by GDP per capita, personal income per capita, and the poverty level for each state. This paper goes into detail on the relationship between the variables and how they determine the quality of the school systems in the United States. This paper pursues the idea that the economic conditions of a state has a significant effect on the quality of education received from that state.

III. Data

The dependent variable used in this paper to determine the quality of a state's public school system is a function of several ranking systems. Since rankings vary by the source, sometimes dramatically, by taking a modified average among several different rankings, we are able to determine a more accurate depiction of the comparative quality of each state's education. We considered rankings provided by: Education Week, US News, Kids Count, NAEP, and Start Class. To aggregate these rankings and to obtain the most representative value for each state, we took the average as the median. This reduced the impact of outliers and of states that were assigned a wide range of varying ranks.

The rankings come from the sources listed above. Some sources provide general rankings while others focus on comparing certain aspects of the school system. Education Week determined ranks for each state based on the chance of success for the average student, achievement of the students, and financial analysis of the school systems. US News ranks the states based on the quality of their public high schools which is determined by how well those high schools prepare their students for college. Kids Count considers four key indicators to determine its rankings. These key indicators are economic well-being, education, health, and family and community. Start Class solely uses the standardized test scores of each state and ranks them depending on the percent of students who performed at or above proficiency.

The explanatory variables we will consider are GDP per capita or personal income per capita for each state from the Bureau of Economic Analysis. We will also consider the poverty level of each state and the Gini coefficient sourced from the United States Census Bureau. The final independent variable considered is the average personal income tax rate in each state which is from Tax Foundation. These factors were selected so that we can determine how the specific economy of each state can affect the public education of that state. We selected GDP, personal income, and poverty level so that we could measure the overall economy of the state, as well as how it is affecting the quality of life for individuals living in that state.

Gauss Markov Assumptions

1. The model is linear in parameters.
2. The data was randomly sampled, as defined in the data sources. Because our population size was 50, data was collected from each state, but the data from each state was randomly sampled.
3. There is no perfect collinearity among the independent variables. There may be degrees of high collinearity among variables such as average personal income and poverty level, but there is no perfect collinearity.
4. As more independent variables are added to the model, the probability of a zero conditional mean increases. For this study, since many potential relevant variables were analyzed and determined not to be significant, it is assumed that the expected value of the error given the independent variables is zero.
5. It is assumed that the explanatory variables contain no information about the variance of unobserved factors.

Because the model does not violate the Gauss Markov assumptions, it can be said that this model is the best estimator of the relationship. Furthermore, because the model does not violate assumptions 1-4, the model is unbiased.

School Ranking

In order to judge quality of education, we used four different systems that ranked the schools from 1-51. The median of the five rankings was used to measure quality of education in order to ensure that the rankings were not skewed heavily by outlier rankings while still achieving accuracy by using a number of different ranking systems. The four rankings used are: Education Week, U.S. News, Kids Count, and Start Class

Average Personal Income

Average income values among individuals in the given state were collected in order to help determine the effect on quality of education. Because of its strong relationship with quality of education, this variable was chosen over GDP per capita for use in the final model. Data on average personal income values was collected from the Bureau of Economic Analysis.

GDP per Capita

GDP per capita was used as an explanatory variable and an indicator of the quality of education. However, GDP per capita was not as strongly correlated with quality of education as average personal income, and thus was not included in the final model. GDP per capita is sourced from the Bureau of Economic Analysis.

Poverty Level

The poverty level, defined as the percentage of the population beneath the federal poverty level (the minimum amount of gross income that a family needs for food, clothing, transportation, shelter, and other necessities), was also used to explain quality of education. It is hypothesized that a lower poverty level will result in a higher quality of education. Poverty level is sourced from the U.S. Census Bureau.

Gini Coefficient

The Gini coefficient is a measure of income inequality in an area and was collected for each of the 50 states. We hypothesize that a lower Gini coefficient (less income inequality) will lead to a higher quality of education. The Gini coefficient is sourced from the U.S. Census Bureau.

Average Income Tax Rate

The average income tax rate for each of the fifty states was collected to predict the quality of education for the respective state. It is hypothesized that a higher income tax rate will lead to a higher quality of education due to an increased level of funding for public education systems. The average income tax rate is sourced from the Tax Foundation.

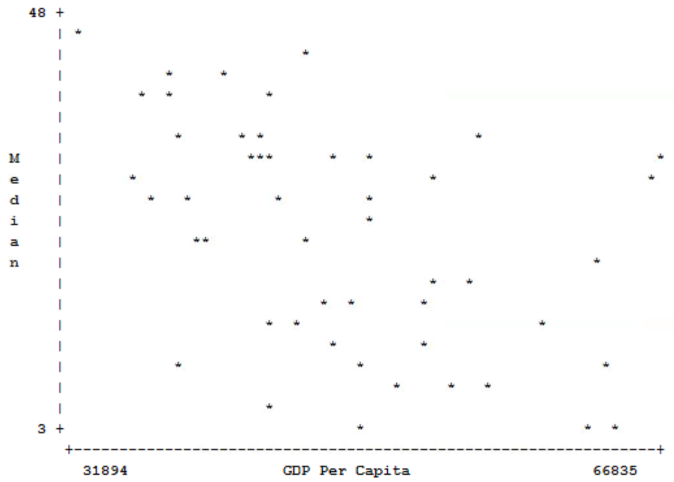
Above Average Personal Income

This is a binary variable that is equal to 1 if the average personal income per capita of the state is above the national average. It was calculated based on the data used to measure personal income per capita.

Explanatory Variable	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
GDP Per Capita	50	48,064.66	8,853.34	31,894	66,835
Personal Income Per Capita	50	46,857.16	7,439.48	34,771	68,704
Poverty Level (%)	50	14.17	3.10	8.2	22
Gini Coefficient	50	0.46374	0.0189896	0.418	0.514
Average State Income Tax Rate	50	4.1874	2.457425	0	9.3

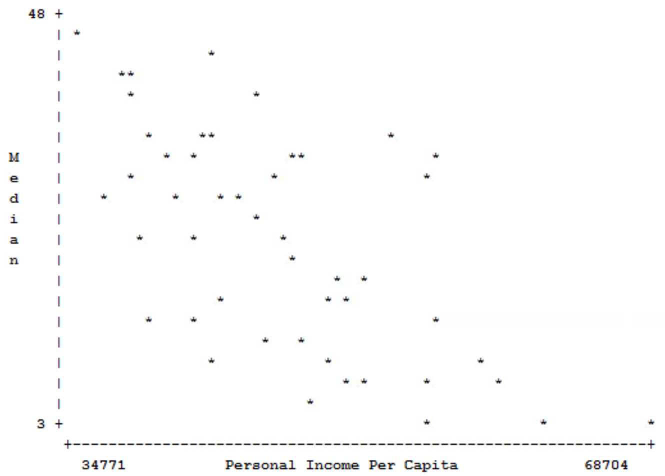
Dependent Variable	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Median Ranking	50	25.52	12.80	3	48

GDP per Capita



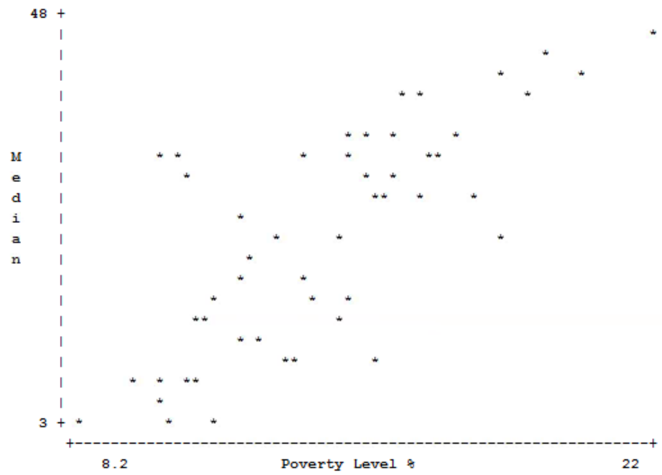
The GDP per capita plot shows a slight negative correlation with educational ranking, but this correlation is very weak.

Average Personal Income



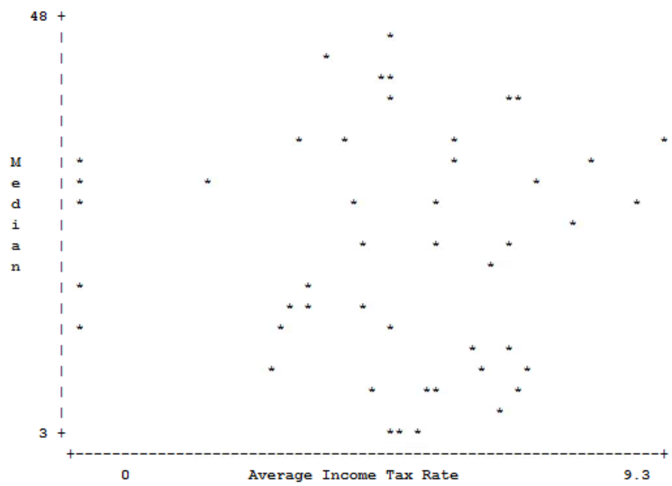
The average personal income plot shows a strong negative correlation with the educational ranking of a state’s school system.

Poverty Level



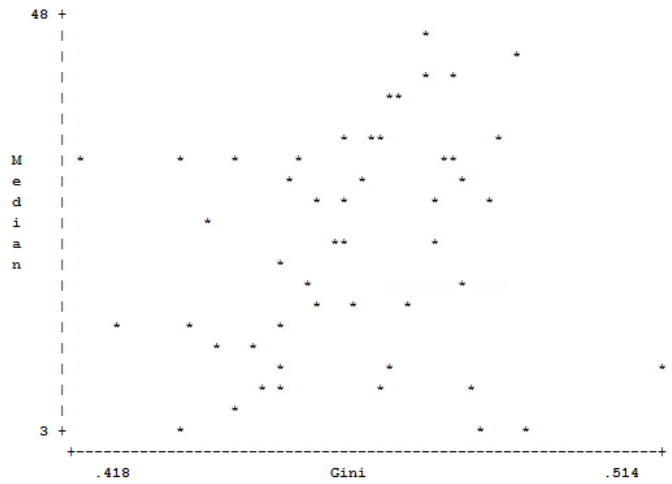
The poverty level plot shows a strong positive correlation with the ranking of the school system.

Average Income Tax Rate



The average income tax rate shows little correlation with educational ranking.

Gini Coefficient



The Gini coefficient plot above shows a slight positive correlation with the ranking of the school system.

Correlation between independent variables:

	GDP Per Capita	Personal Income Per Capita	Poverty Level	Gini Coefficient	Income Tax Rate
GDP Per Capita	1.00				
Personal Income Per Capita	0.88	1.00			
Poverty Level	-0.65	-0.73	1.00		
Gini Coefficient	-0.03	0.05	0.53	1.00	
Income Tax Rate	-0.18	-0.13	0.05	0.08	1.00

Since personal income per capita and GDP per capita are highly positively correlated, only one will be used as an independent variable. If both are used, then there would an issue with collinearity and the regression analysis would be wrong. The scatter plots above show that personal income per capita has a higher correlation than GDP per capita. Because of this result, personal income per capita will be used as an independent variable over GDP per capita. Poverty level, personal income, the Gini coefficient, and the average income tax graphs show the highest correlation. These are also the variables used in the multiple regression.

III. Results

Dependent Variable edurank					
Independent Variables	$\beta_0 + \beta_1$ pinc	$\beta_0 + \beta_1$ pinc + $\beta_2$povlev	$\beta_0 + \beta_1$ pinc + $\beta_2$povlev+$\beta_3$gini	$\beta_0 + \beta_1$ pinc + $\beta_2$povlev+$\beta_3$gini+ $\beta_4$inctax	$\beta_0 + \beta_1$ pinc + $\beta_2$povlev+$\beta_3$gini+β_4 inctax+ $\beta_5$aboveavg
pinc	-0.001125*** (-5.99)	-0.0003699* (-1.57)	0.000375 (1.09)	0.0003192 (0.88)	0.0002677 (0.65)
povlev		2.47071*** (4.37)	4.776209*** (4.92)	4.63572*** (4.56)	4.657024*** (4.52)
gini			-305.1578*** (-2.83)	-289.1598*** (-2.56)	-287.7584*** (-2.51)
inctax				-0.2440583 (-0.51)	-0.2281977 (-0.47)
aboveavg					1.058782 (0.26)
Intercept	78.23419*** (8.78)	7.836242 (0.44)	81.77427*** (2.64)	80.1345*** (2.55)	81.01255*** (2.54)
No. of obs.	50	50	50	50	50
R-square	0.4276	0.5932	0.6535	0.6555	0.6560

T-values shown in parentheses, * indicates significance at 10%, ** 5%, *** 1%

The results of the simple regression and the three multiple regressions are shown in the table above. In regards to the simple regression, both the intercept and the independent variable are highly significant. The second model decreases in the variables' significance. The income variable went from significant at the one percent level in the simple regression to only significant at the ten percent level in the second model, and not significant at all in the third and fourth models. Poverty level is highly significant in the second, third and fourth models. The Gini coefficient is significant at the one percent level for both the third and the fourth models. In the fourth model, income tax and personal income are both insignificant. There could be a problem with multicollinearity between income tax and personal income causing them to be insignificant. The intercept is significant at the one percent level for each model except the second model. The R-squared values increase with each variable added. The increasing R-squared value means that more and more of the variance is explained when adding each new variable to the regression. It also means that each variable has some significance to the explanation of school system rank.

The fourth model shows that for every increase in the Gini coefficient and income tax, the school system rank decreases. The bigger the Gini coefficient the "lower" ranked the school system is. Remember, the lower the rank of the school system, the better that school system is. The fourth model also implies that the higher the income tax the better the school system, but because the coefficient for the income tax variable isn't significant, a huge increase in income tax wouldn't move the school system ranking very much. This can also be interpreted as state governments don't spend enough income tax dollars on public schools that an increase in income tax doesn't affect the school ranking. Poverty level, however, has an effect on school ranking and not in a good way. The coefficient for poverty level is positive. In other words, for every increase in poverty level there is an increase in school system ranking. The higher the poverty level, the higher the school system ranking.

The final model includes a dummy variable, also known as a binary variable, that considers if the state's average personal income per capita is above the national average. The coefficient of the dummy variable is added to the intercept when calculating the state's public school ranking if the state's average personal income per capita is above the national average, or doesn't add anything to the intercept if the state's average is below the national average. This variable did not prove to be significant and did not benefit the model, so we will not consider it as part of our findings.

The results are clear in what variables affect public school system rankings. The variables that are the most significant are poverty level and the Gini coefficient.

P-Values

Dependent Variable edurank				
Independent Variables	Model 1	Model 2	Model 3	Model 4
pinc	0.000	0.062	0.140	0.192
povlev		0.000	0.000	0.000
gini			0.004	0.007
inctax				0.307
Intercept	0.000	0.331	0.006	0.007

From the P-values, we can see that the poverty level is highly significant across all models. The significance of average personal income per capita decreases as additional variables are added to the regression, declining from significant at the 1% level to not significant at the 10% level. The Gini coefficient is significant in both regressions it appears in and average income tax rate is only significant at around 70% significance in the final regression.

F-Test

For an F-test, we want to test joint significance between average personal income and average income tax rate. Therefore, the null hypothesis is that β_1 and β_4 are both equal to 0. Then the resulting F value is 19.59. According to the F-distribution, the probability of the F-value being greater than 19.59 is essentially zero. Therefore, average personal income and average income tax rate are jointly significant.

The next F-test we want to test is for average personal income per capita and poverty level. These variables demonstrated a -0.73 correlation, so we want to test for multicollinearity. The resulting F value is 40.55. According to the F-distribution, the probability of the F-value being greater than 40.55 is essentially zero. Therefore, average personal income per capita and poverty level are jointly significant, and there might be collinearity between these variables.

For the same reason, we also want to test poverty level and the Gini coefficient since they have a correlation of 0.53. This F-test results in a F value of 36.18. Like the previous F-tests, the F-distribution tells us that the probability of the F-value being greater than 36.18 is essentially zero. There could possibly be collinearity between these variables as well.

The results of the F-tests states that the regression using these variables won't be the best predictor of public school rankings. When holding all other variables constant except poverty level, the regression equation won't accurately predict the school ranking because part of the data that needs to be used is tied up in the other variables.

IV. Conclusions

Initially, average personal income is negatively correlated with educational rank such that increased average personal income results in a lower, better rank. However, once the Gini coefficient is considered in the regression, average personal income becomes insignificant. Therefore, these results demonstrate that we cannot use average personal income alone within a state to determine the quality of the public schools in that state.

The hypothesis at the beginning of this paper stated that higher levels of GDP per capita, higher personal income per capita, and lower poverty levels will indicate a higher quality public school system of that state. With the results, it is clear that the hypothesis for lower poverty levels will result in a higher (lower number) ranking school system. GDP per capita did not show a strong correlation with the public school rankings, and experienced multicollinearity with average personal income. Since income per capita had a higher correlation with the school system rankings, it was decided that GDP per capita wouldn't be used in the multiple regression models and personal income per capita would be used. Personal income per capita in two out of the four models wasn't significant which was not hypothesized. Personal income per capita was thought to affect public school system rankings than the regressions showed.

The Gini coefficient and state income tax were added into the regression later in the analysis because the multicollinearity between GDP per capita and personal income per capita created issues in the model. Adding in these two variables helped explain more of the variance in the regression models as indicated by the increasing R-squared values.

In conclusion, the hypothesis was partially rejected and partially not rejected. The stated negative relationship between average personal income and educational ranking was rejected because average personal income lost significance and was positively correlated with educational ranking in later models. The stated negative relationship between GDP per capita and educational ranking was also rejected because GDP per capita failed to show a strong initial correlation with educational ranking, particularly when compared with average personal income. The stated positive relationship between poverty level and educational ranking was not rejected because the poverty level did not lose significance with additional models and continued to show the expected positive correlation.

Appendix

A. Stata Output

Model 1:

```
. regress median personalincome
```

Source	SS	df	MS
Model	3432.28989	1	3432.28989
Residual	4593.69011	48	95.7018773
Total	8025.98	49	163.79551

Number of obs	=	50
F(1, 48)	=	35.86
Prob > F	=	0.0000
R-squared	=	0.4276
Adj R-squared	=	0.4157
Root MSE	=	9.7827

median	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
personalincomepercapita	-.001125	.0001879	-5.99	0.000	-.0015027	-.0007473
_cons	78.23419	8.910352	8.78	0.000	60.31872	96.14965

Model 2:

```
. regress median personalincome povertylevel
```

Source	SS	df	MS
Model	4760.71331	2	2380.35666
Residual	3265.26669	47	69.4737593
Total	8025.98	49	163.79551

Number of obs	=	50
F(2, 47)	=	34.26
Prob > F	=	0.0000
R-squared	=	0.5932
Adj R-squared	=	0.5759
Root MSE	=	8.3351

median	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
personalincomepercapita	-.0003699	.0002355	-1.57	0.123	-.0008435	.0001038
povertylevel	2.47071	.5650201	4.37	0.000	1.334036	3.607384
_cons	7.836242	17.79936	0.44	0.662	-27.97145	43.64393

Model 3:

```
. regress median personalincome povertylevel gini
```

Source	SS	df	MS
Model	5245.03535	3	1748.34512
Residual	2780.94465	46	60.4553185
Total	8025.98	49	163.79551

Number of obs	=	50
F(3, 46)	=	28.92
Prob > F	=	0.0000
R-squared	=	0.6535
Adj R-squared	=	0.6309
Root MSE	=	7.7753

median	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
personalincomepercapita	.000375	.0003428	1.09	0.280	-.000315	.001065
povertylevel	4.776209	.9702007	4.92	0.000	2.823296	6.729121
gini	-305.1578	107.8139	-2.83	0.007	-522.1759	-88.13976
_cons	81.77427	30.95297	2.64	0.011	19.46918	144.0794

Model 4/Unrestricted Model for F-test:

```
. regress median personalincome povertylevel gini averageincometax
```

Source	SS	df	MS
Model	5260.93517	4	1315.23379
Residual	2765.04483	45	61.4454406
Total	8025.98	49	163.79551

Number of obs	=	50
F(4, 45)	=	21.40
Prob > F	=	0.0000
R-squared	=	0.6555
Adj R-squared	=	0.6249
Root MSE	=	7.8387

median	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
personalincomepercapita	.0003192	.0003625	0.88	0.383	-.000411	.0010494
povertylevel	4.63572	1.016356	4.56	0.000	2.588674	6.682767
gini	-289.1598	113.1516	-2.56	0.014	-517.0588	-61.26076
averageincometaxrate	-.2440583	.4797801	-0.51	0.613	-1.210385	.7222685
_cons	80.1345	31.37146	2.55	0.014	16.94914	143.3199

Model 5:

```
. regress median personalincome povertylevel gini averageincometax aboveavg
```

Source	SS	df	MS
Model	5265.32651	5	1053.0653
Residual	2760.65349	44	62.7421247
Total	8025.98	49	163.79551

Number of obs	=	50
F(5, 44)	=	16.78
Prob > F	=	0.0000
R-squared	=	0.6560
Adj R-squared	=	0.6169
Root MSE	=	7.921

median	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
personalincomepercapita	.0002677	.0004149	0.65	0.522	-.0005685	.0011039
povertylevel	4.657024	1.030177	4.52	0.000	2.58084	6.733209
gini	-287.7584	114.4619	-2.51	0.016	-518.4413	-57.0756
averageincometaxrate	-.2281977	.4885087	-0.47	0.643	-1.212722	.7563269
aboveavg	1.058782	4.002098	0.26	0.793	-7.006917	9.124482
_cons	81.01255	31.87401	2.54	0.015	16.7747	145.2504

Restricted model for first F-test:

```
. regress median povertylevel gini
```

Source	SS	df	MS
Model	5172.68272	2	2586.34136
Residual	2853.29728	47	60.7084528
Total	8025.98	49	163.79551

Number of obs	=	50
F(2, 47)	=	42.60
Prob > F	=	0.0000
R-squared	=	0.6445
Adj R-squared	=	0.6294
Root MSE	=	7.7916

median	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
povertylevel	3.821102	.4240433	9.01	0.000	2.968037	4.674167
gini	-214.6059	69.22769	-3.10	0.003	-353.8741	-75.33775
_cons	70.88869	29.37128	2.41	0.020	11.80129	129.9761

Restricted model for second F-test:

```
. regress median gini averageincometax
```

Source	SS	df	MS
Model	278.019931	2	139.009965
Residual	7747.96007	47	164.850214
Total	8025.98	49	163.79551

Number of obs	=	50
F(2, 47)	=	0.84
Prob > F	=	0.4367
R-squared	=	0.0346
Adj R-squared	=	-0.0064
Root MSE	=	12.839

median	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gini	121.0706	96.9359	1.25	0.218	-73.93926	316.0805
averageincometaxrate	-.3445187	.7490656	-0.46	0.648	-1.851444	1.162407
_cons	-28.9656	44.82972	-0.65	0.521	-119.1514	61.22017

Restricted model for third F-test:

```
. regress median personalincome averageincometax
```

Source	SS	df	MS
Model	3587.50144	2	1793.75072
Residual	4438.47856	47	94.435714
Total	8025.98	49	163.79551

Number of obs	=	50
F(2, 47)	=	18.99
Prob > F	=	0.0000
R-squared	=	0.4470
Adj R-squared	=	0.4235
Root MSE	=	9.7178

median	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
personalincomepercapita	-.0011571	.0001883	-6.15	0.000	-.0015358	-.0007783
averageincometaxrate	-.7307144	.5699723	-1.28	0.206	-1.877351	.415922
_cons	83.25634	9.679351	8.60	0.000	63.78399	102.7287

B. Above Average Personal Income States

Alaska
California
Colorado
Connecticut
Delaware
Hawaii
Illinois
Kansas
Massachusetts
Maryland
Minnesota
North Dakota
Nebraska

New Hampshire
New Jersey
New York
Pennsylvania
Rhode Island
South Dakota
Texas
Virginia
Vermont
Washington
Wyoming

C. Below Average Personal Income States

Alabama
Arkansas
Arizona
Florida
Georgia
Iowa
Idaho
Indiana
Kentucky
Louisiana
Maine
Michigan
Missouri
Mississippi
Montana
North Carolina
New Mexico
Nevada
Ohio
Oklahoma
Oregon
South Carolina
Tennessee
Utah
Wisconsin
West Virginia

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